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St. Catherine Creek NWR
P.O. Box 117
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MISSISSIPPI
May 2, 2003 DEPARTMENT OF WILDLIFE, FISHERIES AND PARKS

SAM POLLES, Ph.D.
Executive Director

Hi Steve,

Hope all is well in your neck of the woods. Enclosed is the 2002 Interim Status Report, "Assessment of *Corynorhinus rafinesquii* Roost Characteristics at St. Catherine Creek National Wildlife Refuge, Adams County, Mississippi." If you have any questions, comments, or suggestions please let me know. I've included one copy for you and one for Randy.

Current trips planned to the refuge include May 16-18, May 30-June 1, and June 13-15. Could we use the volunteer house and truck on these dates? I'll call a few days before each trip to make sure it's alright.

Thanks for everything!

A handwritten signature in cursive script that reads "Alison Sherman".

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**Assessment of *Corynorhinus rafinesquii* Roost Characteristics at St. Catherine
Creek National Wildlife Refuge, Adams County, Mississippi**

2002 Interim Status Report

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Submitted to:

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ABSTRACT

Roost sites of Rafinesque's big-eared bats (*Corynorhinus rafinesquii*) were examined in abandoned buildings at St. Catherine Creek National Wildlife Refuge, Adams County, Mississippi, from March through December, 2002. In 2002, seven abandoned structures were documented to serve as roost sites on and immediately adjacent to the refuge. Only one site on the refuge was verified to be a maternity roost. This colony contained 35 adult females, recorded on May 26. Another structure on property adjoining the refuge contained 32 *C. rafinesquii* on September 16. Other structures supported from 0-9 individuals during the survey period. Twenty-five *C. rafinesquii* were hand netted in the roosts after pups were volant. Captured bats were weighed, sexed, measured and banded using split ring bands. Standard mist netting was conducted at 17 sites on the refuge from April through October. Eight *C. rafinesquii* were captured at three sites. This was the most frequently captured species, representing 38% of all captures. Other bat species netted during the survey period included the evening bat (*Nycticeius humeralis*) (29%), eastern red bat (*Lasiurus borealis*) (19%), southeastern myotis (*Myotis austroriparius*) (9%), and big brown bat (*Eptesicus fuscus*) (5%). A large colony of *M. austroriparius* was also discovered in a cistern on bluffs east of the refuge in November. Roost characteristics for *C. rafinesquii* were evaluated and data regarding internal temperature and humidity were recorded. Roost dimensions, location of bats within the roost, and roosting substrate were also noted. Roost searches, mist netting and monitoring of roost characteristics will continue in 2003.

INTRODUCTION

Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) is a rare species found in the southeastern United States. *C. rafinesquii* was formerly listed as a category 2 species (a classification no longer in use), under the Federal Endangered Species Act, meaning that this species was possibly endangered or threatened, but sufficient data for classification were lacking. Currently, this species is federally listed as a species of special concern and state listed as endangered, threatened or a species of special concern throughout its range. For the state of Mississippi, this species is listed as a species of special concern by the Mississippi Natural Heritage Program (2001). According to the U.S. Geological Survey-Biological Resources Division (Clark 2000b), *C. rafinesquii* is thought to be declining, however further research is needed to determine the extent of decline.

One of the primary causes for bat population decline in the southeastern United States is habitat destruction (Fenton 1983). The loss of bottomland hardwood forests is a prime example of this decline of ideal bat habitat. These forests were once common in the Southeast and contain some of the best remaining habitats for bats. Studies conducted by Clarke (2000a) and Cockran et al. (1999) have shown that mature bottomland hardwood forests are essential habitat for 11 of 18 bat species found in the East, including *C. rafinesquii*. Bottomland hardwood forests are becoming greatly

reduced due to silviculture practices that eliminate mature stands. Fifty-six percent of southern bottomland hardwood and baldcypress (*Taxodium distichum*) forests were lost between 1900 and 1978 (Bass 1989).

Bottomland hardwood forests provide optimal foraging habitat for *C. rafinesquii* and often contain large, buttressed trees with cavities for roosting (Clark 2000b). Roost trees provide sites for mating, hibernation, and rearing of young as well as protection from harsh weather and predators (Kunz 1982). Bats spend over half of their time in roosts, which are considered a limiting factor for *C. rafinesquii* (Clark 2000a). As a result of declining habitat, this species can often be found in alternative roost sites such as abandoned houses (Hall 1998), old cisterns (Harvey et al. 1999), and bridges (Lance et al. 2001). In fact, the majority of known maternity colonies are found in abandoned and decayed buildings (Barbour and Davis 1969). However, these structures are often unstable and do not offer a permanent roosting site. Therefore, one feature on which conservation objectives should focus is maintaining habitats containing preferred roosts. Before implementation of conservation practices, it is essential to determine characteristics of occupied roosts, particularly maternity sites, to ascertain preferences.

To determine the extent of decline or general population trends for this species, studies regarding available roosts and occupancy rates at those roosts are essential. The availability and quality of nursery roosts are especially important for determining the distribution and abundance of bats (Humphrey 1975). Given that these roosts are the site for gestation, lactation, and development of young, they are critical for the preservation of bat species. Maternal roosts must provide both protection from predators and optimal microclimate for gestating and lactating females and developing young (Humphrey 1975). In order for adequate conservation practices to be developed for bats, research studies regarding habitat and roost preferences, particularly those for maternity roosts, are critically needed. Data obtained from these types of studies can affect the development of proper management practices in two ways. First, by determining habitat and roost needs, conservation tactics can be specifically designed to maintain appropriate and relevant land areas. Secondly, in situations where preservation of ideal habitat is impossible, information obtained by studying tree roosts and alternative roosts such as abandoned houses can be important for the creation of artificial roosts. Bat houses have become a successful management tool in providing artificial roosts for bats whose natural habitat is declining (Tuttle and Hensley 1993). By identifying desirable characteristics in abandoned houses and tree roosts, attempts can be made to replicate these traits in artificial roosts to optimize successful relocation.

A maternal colony of *C. rafinesquii* was first recorded at St. Catherine Creek NWR, Adams County, MS, in 1996. In 1998, two maternity colonies and some lone individuals were recorded, totaling 40 bats in four abandoned houses. Only one maternity colony was found in 2000 (Trousdale, personal comm.) and it was reported to contain as many as 60 individuals. This is the largest known maternity colony of *C. rafinesquii* for the state of Mississippi.

OBJECTIVE

The objectives for this study were to: 1. assess characteristics of known roosts of *C. rafinesquii* at St. Catherine Creek NWR, 2. examine colony dynamics at roosts with regard to sex/age class ratios and number of individuals, 3. locate additional roosts for *C. rafinesquii* on and surrounding the refuge, and 4. document other species of bats on and adjacent to the refuge.

STUDY AREA

This study was conducted at St. Catherine Creek NWR (Figure 1). The refuge was first established in 1990 to preserve, improve, and create waterfowl habitat. St. Catherine Creek NWR encompasses 9763 ha and is located in the western section of Adams County in southwest Mississippi, 11.3 km. south of Natchez, Mississippi. The refuge has a variety of habitats. Bald cypress swamps and hardwood forests with a prevalence of oak (*Quercus* spp.), gum (*Nyssa* spp.), elm (*Ulmus* spp.), ash (*Fraxinus* spp.), and cottonwood (*Populus deltoides*), comprise 30% of the refuge (St. Catherine Creek 2001). Ten percent of the acreage is open water, while the remaining area consists of cleared land. The Mississippi River is located along the eastern boundary and the Homochitto River is located along the southern boundary of the refuge. The refuge floods yearly from backwater from St. Catherine Creek and the Mississippi River. Flooding in depressions and basins of low areas creates ideal habitat for many species that can be found on the refuge.

MATERIALS AND METHODS

Known roosts were monitored three weekends a month from April-October 2002 and once a month in November and December 2002. Characteristics noted included species composition, number of individuals, location of bats in roost, and position in relation to one another. Outer dimensions of each house were determined using a 50 m. graduated cloth measuring tape and overall height was measured using a clinometer (Suunto). Roost type, condition, number of stories, number of rooms and height of ceiling were also recorded.

Temperature and humidity within roosts were measured using data loggers (HOBO RH/Temp/Light H8). Data loggers were placed in submersible cases (HOBO) to avoid moisture interference and recorded information at 30-minute intervals for the entirety of the study. Data loggers were downloaded using a shuttle (HOBO) and relaunched once a month. One logger was placed in each of the four most frequently used houses. Ambient temperature and humidity outside of the roosts were also determined.

To locate additional roosts on and surrounding the refuge, trailers, abandoned buildings, deer stands, cisterns, and bridges were surveyed for evidence of bats. Trailers, abandoned buildings, and deer stands were located using maps attained

from refuge personnel. Bridges were located using a Mississippi road atlas (Delorme Gazatter) by investigating areas where creeks crossed roads. Cisterns were located by examining areas surrounding old homesteads on the refuge and through consultation with Kathy Moody (manager of Laurel Hill Plantation) regarding cistern locations on Laurel Hill Plantation. Laurel Hill Plantation is a protected natural area located on bluffs east of the refuge and encompasses 1,518 acres of forested land. Two trailers, two abandoned buildings, 12 deer stands, six cisterns, and eight bridges were surveyed a minimum of two times each. Using a 500 candle power spotlight (Magnum Max) structures were examined for bat occupancy and bat guano.

An alternative bat house was constructed by refuge personnel in September, 2002 directly in front of roost 1. This house is approximately eight feet wide by ten feet long by eight feet tall. The design is based on Laura Finn's recommendations, who has done extensive research regarding preferred bat house characteristics for *C. rafinesquii* (Finn 2002). This house was surveyed once a month from September-December, 2002.

Mist net surveys were conducted a minimum of twice a month from April-October 2002 to observe habitat usage by *C. rafinesquii* and species diversity at St. Catherine Creek NWR. Sites were selected based on location of ponds and suitable habitat using topographic maps. A minimum of two nets (6 m. length, 30 mm mesh, Avinet) were used per site and placed above waterways, dirt roads, or other potential flyways. Nets were opened 15 minutes before sunset and closed at approximately midnight. Nets were checked every ten minutes for captured bats. Individuals were occasionally hand-netted within roosts with a Tropic-Net (BioQuip, Inc.) to obtain additional data regarding growth, sex, and species. To minimize disturbance, hand netting within a roost did not occur until late July when pups were volant. Captured *C. rafinesquii* were banded with numbered and colored, split-ring plastic bird bands (Size XCL, 3.0 mm interior diameter, A.C. Hughes, Middlesex, England) (on the left forearm for males and right for females), and released after processing. A different colored band was used for each net site and roost site to observe movement of individuals between habitats and roosts.

All bats captured via hand net or mist net, were identified to species and sex. Reproductive status (pregnant, lactating, or scrotal) was derived using methods described by Kunz (1988). Age class was estimated by pelage color (Jones and Suttkus 1975) and degree of ossification of epiphyseal caps on phalanges of fingers (Kunz 1988). Weight, using a spring scale (30g. Pesola Micro-Line), and forearm length, using a plastic dial caliper (Forestry Suppliers) were determined. A personal navigator (Garmin GPS 45XL) was used to determine capture location.

RESULTS

Roost Characteristics

In 1996 three abandoned houses were documented to serve as roost sites for *C.*

rafinesquii (Hall 1999). These roosts were surveyed for bat occupancy a minimum of twice a month from March-October, 2002 and once a month in November-December, 2002 (Table 1). Four new roosts were located on and adjacent to the refuge (abandoned houses), totaling seven roosts (Figure 2-3). These roosts were surveyed a minimum of once a month from August-December, 2002 (Table 1) to observe number of individuals. Roost 1 was confirmed to be a maternal colony and contained 35 adult females, recorded on May 26. Roost 2 contained from 0-9 individuals and roost 3 contained from 0-4 individuals during the survey period (Figure 4). Roost 4 contained a maximum of 32 individuals recorded on September 19. Roosts 5, 6, and 7 contained from 0-1 individual throughout the survey period (Figure 5).

One cistern on bluffs east of the refuge (on Laurel Hill Plantation) was found to contain a large colony of *M. austroriparius*. Eleven individuals (five females and six males) were captured via hand net and processed on November 15, 2002. An attempt was made on December 13, 2002 to conduct an emergence count. One-hundred and forty-two bats were counted from 5:30 PM to 6:30 PM. The temperature at this time was 42 degrees and emergence became erratic with individuals quickly flying back into the cistern. The count was ended at this time because an accurate count could no longer be assured. No bats were found in the other seven cisterns, deer stands, under bridges, or in the constructed bat house.

One of the primary objectives for this study was to determine if there were significant differences in characteristics between the roosts, with particular emphasis on the maternal colony. Therefore, analysis of roost characteristics was conducted when the maternal colony was present (March-September). However, dataloggers were not installed at this time, so the period being considered for analysis of temperature and humidity data is June-August, 2002. Although roost 4 currently has a logger installed, this roost was not discovered until late August. Therefore, it was not considered for this analysis. Temperature data for roosts 1-3 from June-August 2003 show roost 1 as having higher extremes than the other two roosts (Figure 6). This house is heavily decayed and more exposed to the elements than the other houses. Because of these extremes, mean temperature per day (which would ignore extremes) was not analyzed, but instead maximum and minimum temperature per day per roost and the maximum and minimum humidity per day per roost were used for statistical analysis (Figure 7-10). Minimum temperatures per day for roost 1 were lower than the other two roosts, while maximum temperature for roost 1 was higher than the other two roosts.

A two-way Analysis of Variance (ANOVA) was run using STASTICA software, to determine if there were significant differences in temperature and humidity between roosts (Table 2). Significant differences were found between the roosts for maximum and minimum temperature and maximum and minimum humidity. To determine which roosts were significantly different from one another a Least Significant Difference (LSD) test was run using STATISTICA software with differences for both tests being significant when the p-value <0.05. Significant differences in maximum temperature were found

between roost 1 and roost 2 as well as roost 1 and roost 3 (Table 2). There were no significant differences in maximum temperature between roost 2 and 3. Significant differences were found between all three roosts for minimum temperature, maximum humidity, and minimum humidity (Table 2).

Colony Dynamics

C. rafinesquii females outnumbered males by 3:1 in roosts 1, 2, and 4 (Table 3). Females and males were equally numbered (1:1) in roost 3. However the sample size for this house was only two. There were only six confirmed juveniles during 2002. Three of these were observed in the maternal colony and three of these were captured in mist nets. Mean forearm length for females was 41.62mm (n=25) (41.35 to 46.15) and 42.29mm (n=6) (40.02 to 44.37) for males (disregarding juvenile measurements). Weights were analyzed for males and females by month (disregarding juvenile weights) (Table 4). Females were heaviest between July and August with the heaviest female weighing 11.5g on July 27, 2002 (n=24). Males were lightest during this time period with the lightest male weighing 7.5g on July 28, 2002 (n=5).

Species Diversity

Thirty-one net nights, representing 119 sample hours at 17 locations were conducted on the refuge to determine species presence and foraging habitat use (Figure 11-12 and Table 5). Twenty-one bats were captured during the survey period, averaging 0.68 bats captured per net night. Eight *C. rafinesquii* were captured at three sites. *C. rafinesquii* was the most frequently captured species, representing 38% of all captures. Other bat species netted during the survey period included the evening bat (*Nycticeius humeralis*) (29%), eastern red bat (*Lasiurus borealis*) (19%), southeastern myotis (*Myotis austroriparius*) (9%), and big brown bat (*Eptesicus fuscus*) (5%) (Figure 13).

To observe species diversity within roosts, hand netting occurred after pups were volant in late July. *C. rafinesquii* individuals were also hand netted within roosts to gather additional data regarding sex/age class and growth information. Twenty-six *C. rafinesquii* were hand netted in 5 different roosts, 2 *E. fuscus* individuals were caught in two different roosts, and 4 *M. austroriparius* were captured at 3 different roosts.

DISCUSSION

Bridges have been found to be a common alternative roost for *C. rafinesquii* (Trousdale 2003, Lance et. al. 2001, Wolters 2002, pers. comm.), and cement T-beam style bridges are preferred. Bridges surveyed on and surrounding the refuge were likely uninhabited due to their location and structure. Two of the bridges surveyed were flooded for portions of the year making them potentially unsuitable for roosting. Most of the other bridges checked were wooden and emanated the smell of creosote. Deer stands

are probably unsuitable roosts for *C. rafinesquii*. Stands examined on the refuge are small in comparison to abandoned house roosts and hot in the summer. Several of the deer stands surveyed were inhabited by barn owls (*Tyto alba*).

The possibility for bat occupancy at the constructed bat house could be increased with some minor structural changes. Suggestions for improvement include dismantling of the chicken wire that has been posted to the ceiling. This substrate attracts construction of wasp nests and is unsuitable for bat roosting. Hardware cloth would be a better alternative in these areas. The interior of the roof, which is currently lined with insulation, should be covered with boards. Wood is a preferable roosting substrate for bats. Large numbers of wasps are currently occupying this structure. It might be beneficial to kill these colonies with insecticide to enhance the possibility of bat habitation.

It is of some concern that the size of the maternal colony for *C. rafinesquii* at St. Catherine Creek NWR has declined from over 60 individuals in 1999 to 35 individuals in 2002. This decline could be caused by individuals simply relocating to a different roost. However, it could also indicate an overall decline of this species on the refuge or in the immediate area. Further research is necessary to locate additional roosts and/or attempt to determine population trends for this species. It is also of concern that there were only six confirmed juveniles. This raises some questions regarding reproductive success of this colony. It is possible that observations of some juveniles were missed in roost 1 because of small size, color, and location on the mother (between the mother's stomach and the wall). However, most of the maternal colony apparently did not successfully produce offspring in 2002. Possible reasons for this deficiency are unclear at this time.

Although significant differences in maximum and minimum temperature and maximum and minimum humidity were found between roost 1 and the other two roosts, it is likely that other factors are contributing to *C. rafinesquii* habitation. Internal roost characteristics that could be factors include access to the interior of the roost (number of entrance/exit holes), predation, and parasites. External factors that may affect habitation by this species include proximity of the roost to water, proximity to additional roosts, surrounding habitat type, and proximity to foraging habitat. Some of these factors will be examined for the 2003 field season, with a particular emphasis on habitat characterization.

FUTURE RESEARCH

Roost searches, mist netting and monitoring of roost characteristics will continue in 2003. Objectives for the 2003 field season will be the same as 2002 objectives however additional techniques will be used to obtain more data. To further observe habitat usage and species composition at St. Catherine Creek NWR, radio telemetry and AnaBat detection will be added to the study (grants pending). Radio telemetry will be used to locate additional roosts with an emphasis on tree roosts. To obtain additional information concerning species composition and activity of bats on the refuge, an AnaBat

II Bat Detector (Titley Electronics) will be used while mist netting (grants pending). This device detects echolocation calls in frequencies beyond human detection range. All calls will be recorded and downloaded into a PC. Calls will then be analyzed to identify species.

Surveys for *M. austroriparius* will be added to the 2003 field season. The cistern containing a large colony of this species, located on the Laurel Hill Plantation, will be surveyed once a month. A minimum of 10 females will be captured via hand net and processed monthly to record weight changes. Laurel Hill Plantation is a protected natural area found along the eastern boundary of St. Catherine Creek NWR. This property contains 1,518 acres of forested area with a prevalence of oaks (*Quercus* spp.), magnolia (*Magnolia* spp.), maple (*Acer* spp.), bald cypress (*Taxodium distichum*), elm (*Ulmus* spp.), and other hardwoods. Mist net surveys will also be conducted on this property.

ACKNOWLEDGEMENTS

Presentations of the 2002 field season were made at the Mississippi Bat Working Group Meeting (1/03) and the Southeastern Bat Diversity Network Meeting (2/03). Four newspaper articles and one newsletter have also been written featuring this study. All of which expressed my sincere gratitude to Chester Martin, The Mississippi Museum of Natural Science and St. Catherine Creek National Wildlife Refuge for their help and support.

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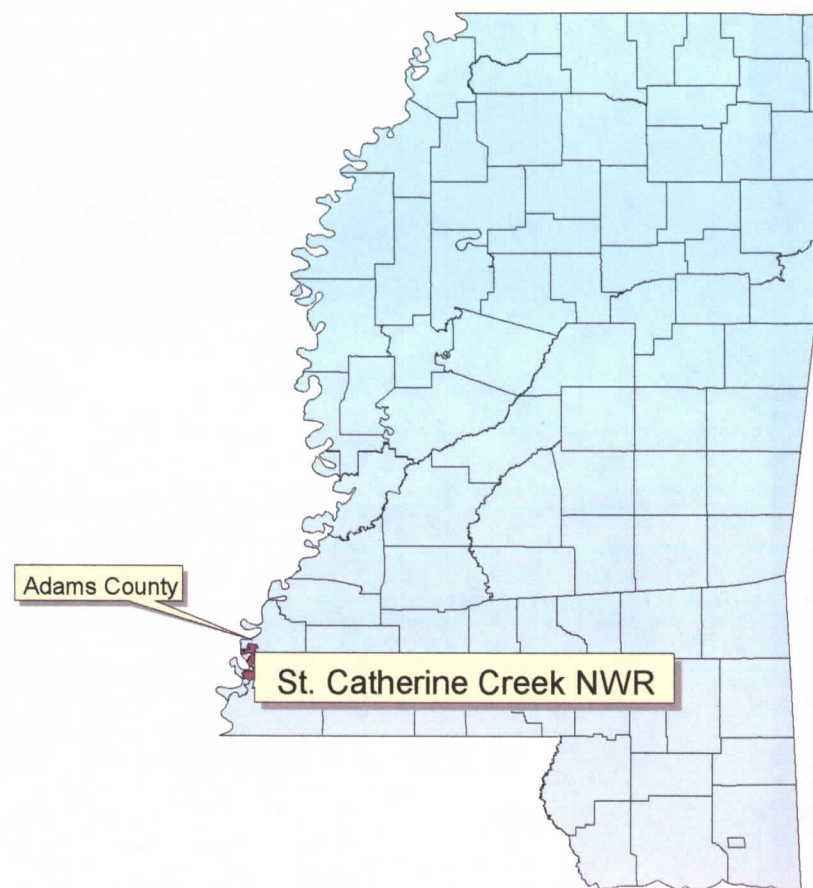
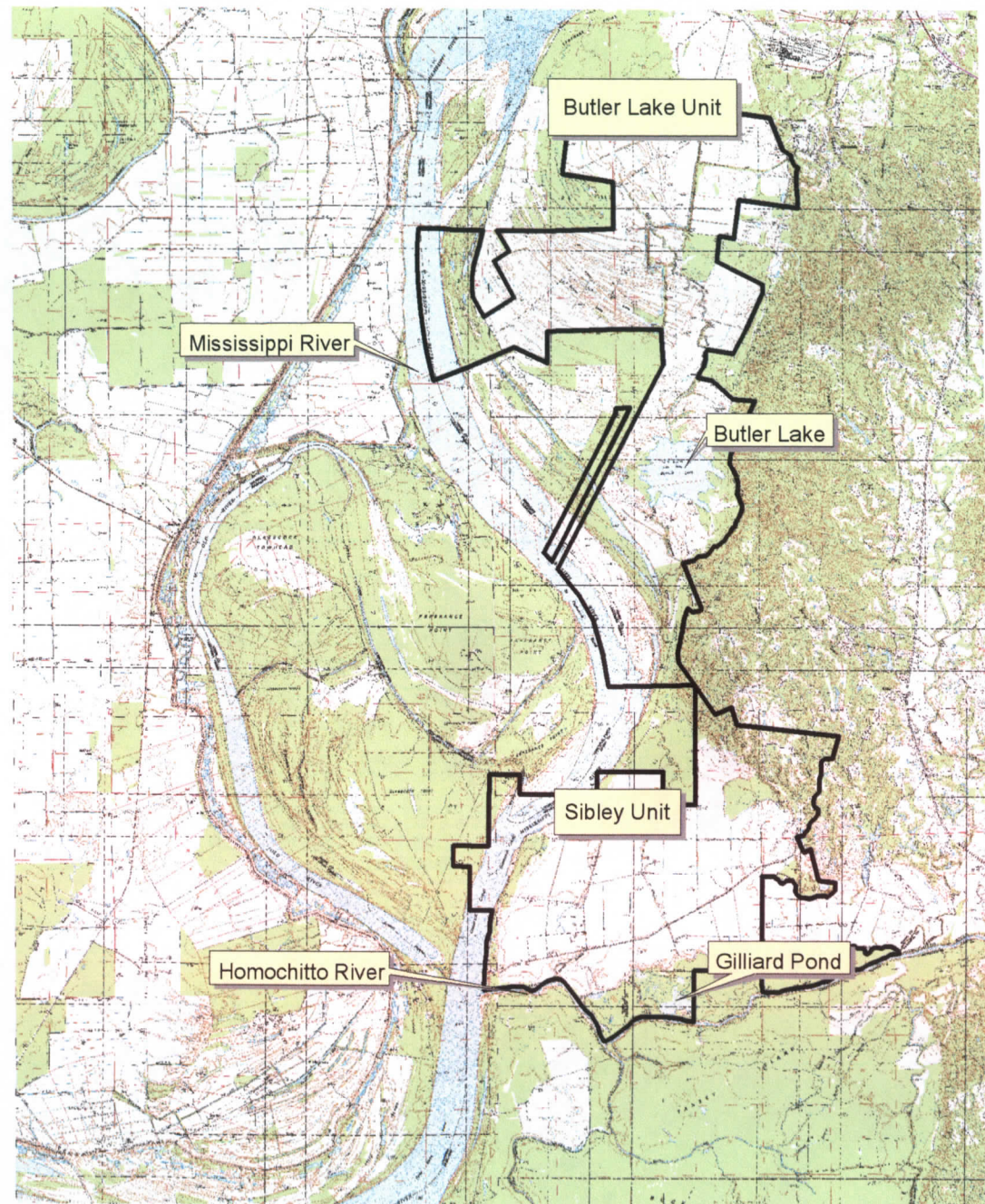


Figure 1: Location of St. Catherine Creek National Wildlife Refuge

Table 1: Survey dates for seven roosts, March-December, 2002.

Date	House 1	House 2	House 3	House 4	House 5	House 6	House 7
03/16/02	X	X	X	Discovered on	Discovered on	Discovered on	Discovered on
03/30/02	X			8/30/03	8/30/03	9/29/03	9/29/03
04/12/02	X						
04/13/02		X					
04/14/02	X						
04/27/02	X						
05/11/02	X	X	X				
05/15/02	X	X	X				
05/24/02	X						
05/25/02	X	X	X				
05/26/02	X						
06/07/02	X						
06/08/02	X	X	X				
06/09/02	X						
06/21/02	X						
06/22/02		X	X				
06/23/02	X						
07/06/02	X	X	X				
07/23/02	X	X					
07/27/02	X	X	X				
07/28/02	X						
08/16/02	X						
08/17/02		X	X				
08/30/02	X			X			
08/31/02		X	X				
09/01/02	X			X	X		
09/06/02	X			X	X		
09/07/02		X	X	X	X		
09/14/02	X	X	X	X	X		
09/15/02		X					
09/16/02		X		X			

Date	House 1	House 2	House 3	House 4	House 5	House 6	House 7
09/28/02	X	X	X	X	X		
09/29/02	X	X	X	X	X	X	X
09/30/02				X	X		
10/12/02	X	X	X	X	X	X	
10/18/02				X	X		
10/19/02	X	X	X	X	X		
10/25/02	X		X	X	X	X	X
10/26/02	X			X	X		
11/15/02	X	X	X	X	X		
12/13/02	X	X	X	X	X	X	X

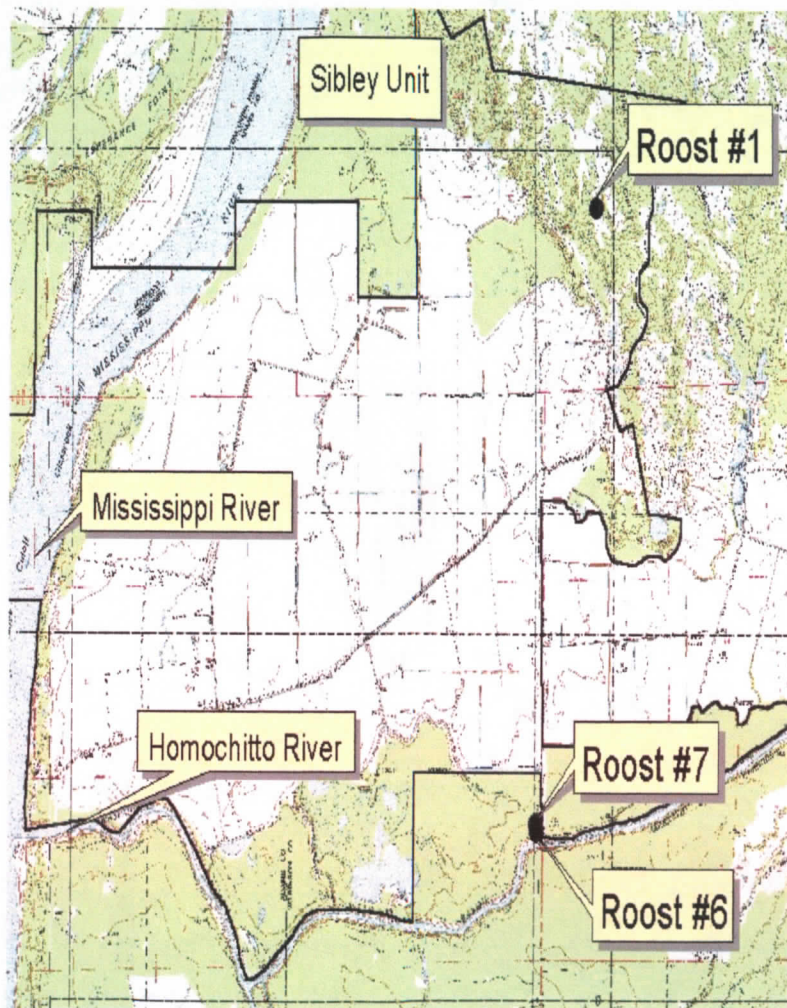


Figure 2. Roosts on the Sibley Unit of St. Catherine Creek National Wildlife Refuge that were surveyed for bats in 2002.

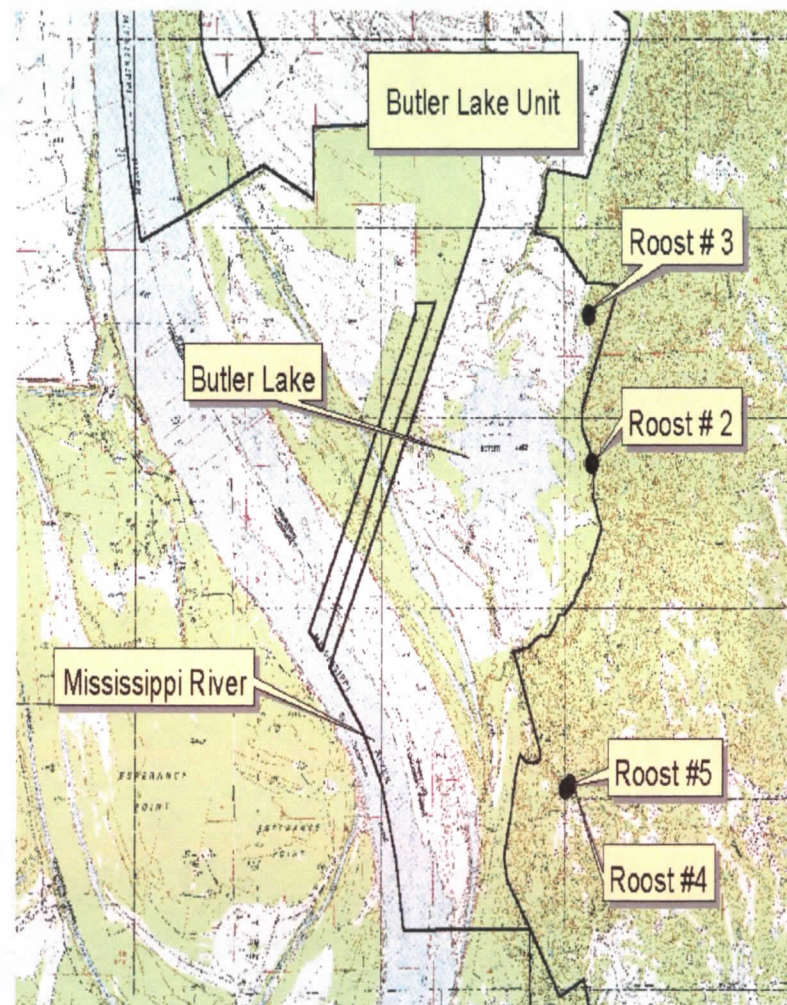


Figure 3. Roosts on the Butler Lake Unit of St. Catherine Creek National Wildlife Refuge that were surveyed for bats in 2002.

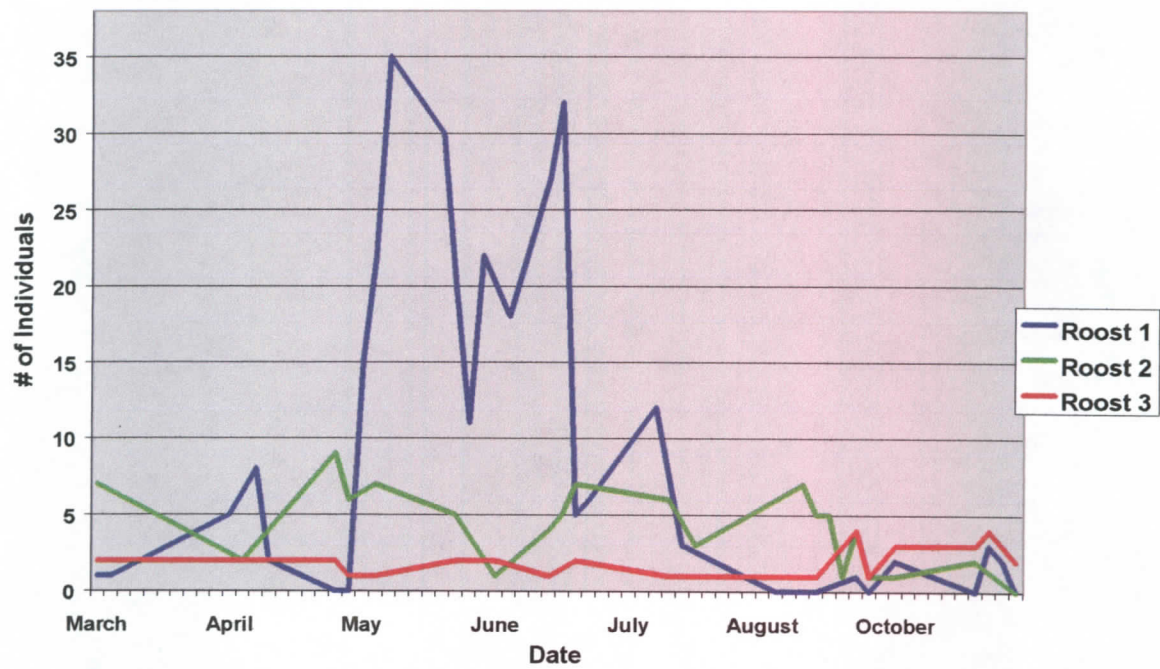


Figure 4: Occurrence of *Corynorhinus rafinesquii* in roosts 1-3 from March-November, 2002.

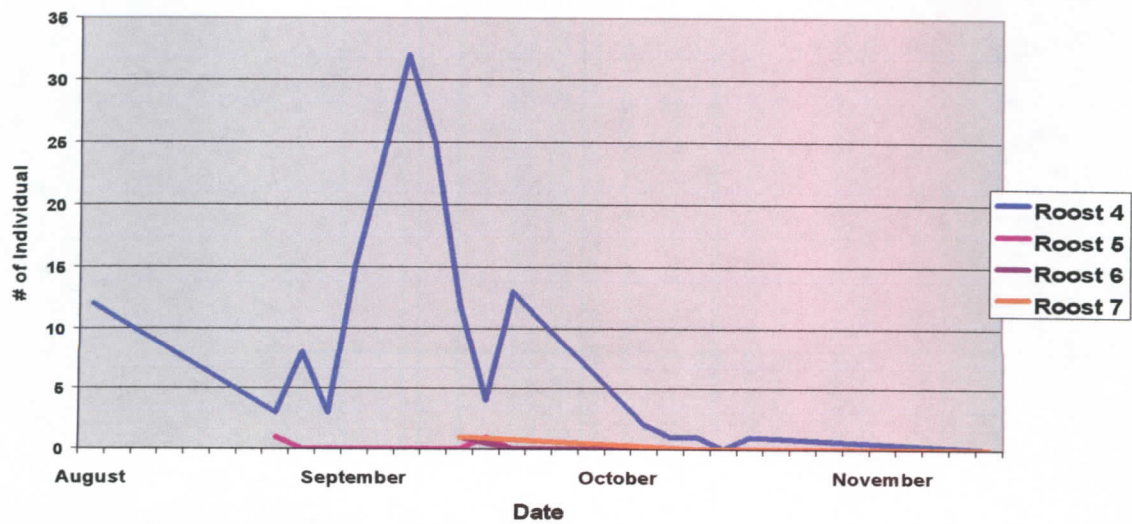


Figure 5: Occurrence of *Corynorhinus rafinesquii* in roosts 4-7 from August-December, 2002.

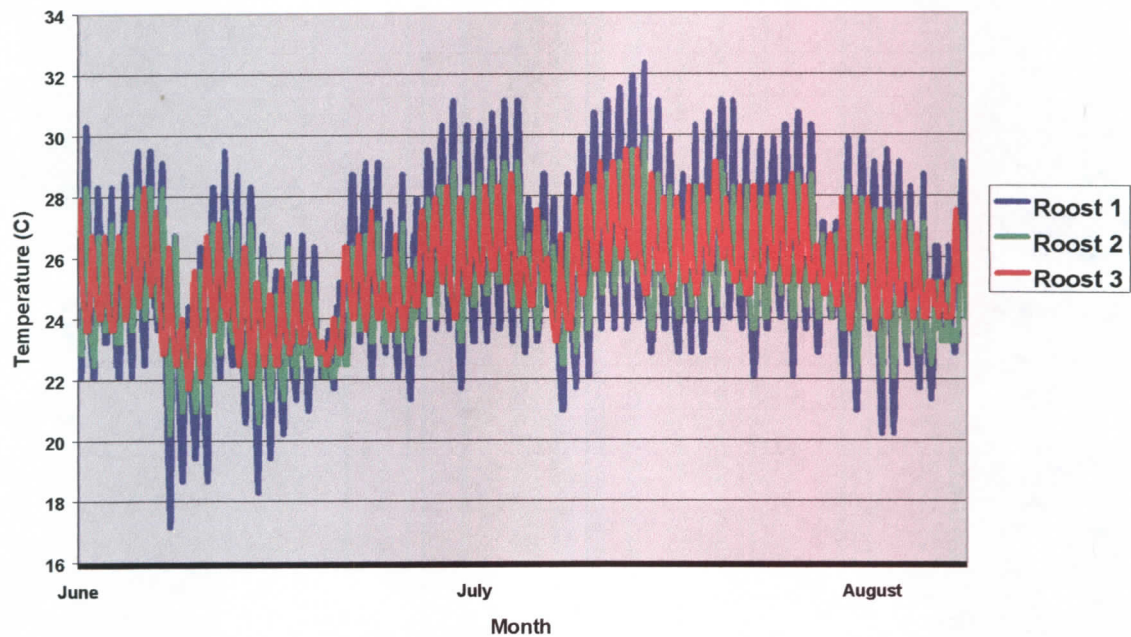


Figure 6: Mean internal temperature in roosts 1-3 from June – August, 2002.

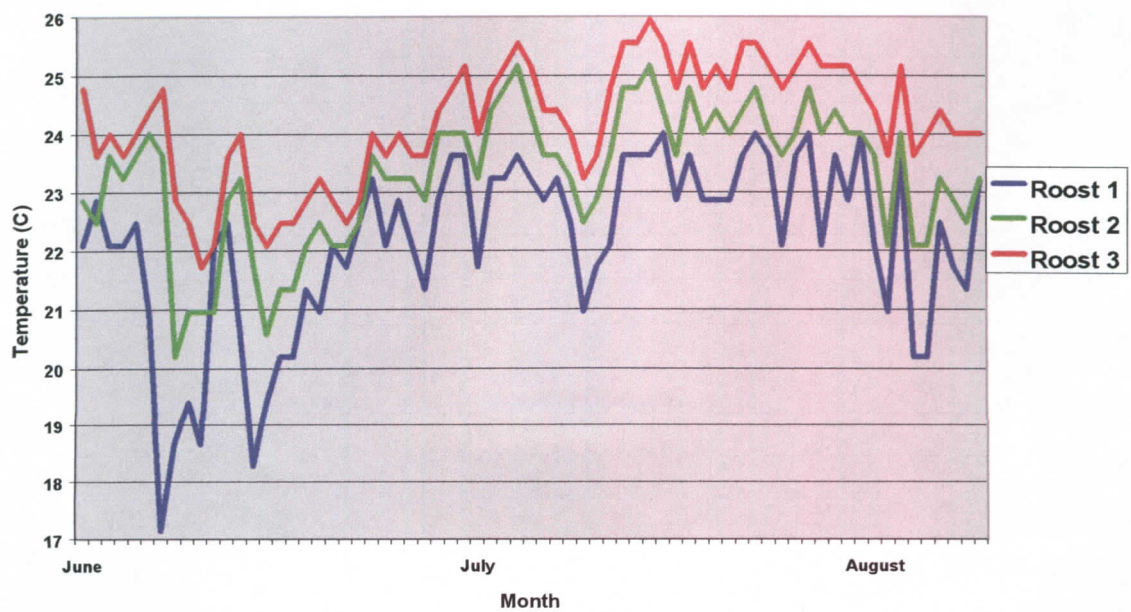


Figure 7: Minimum internal temperature for roosts 1-3 from June-August, 2002.

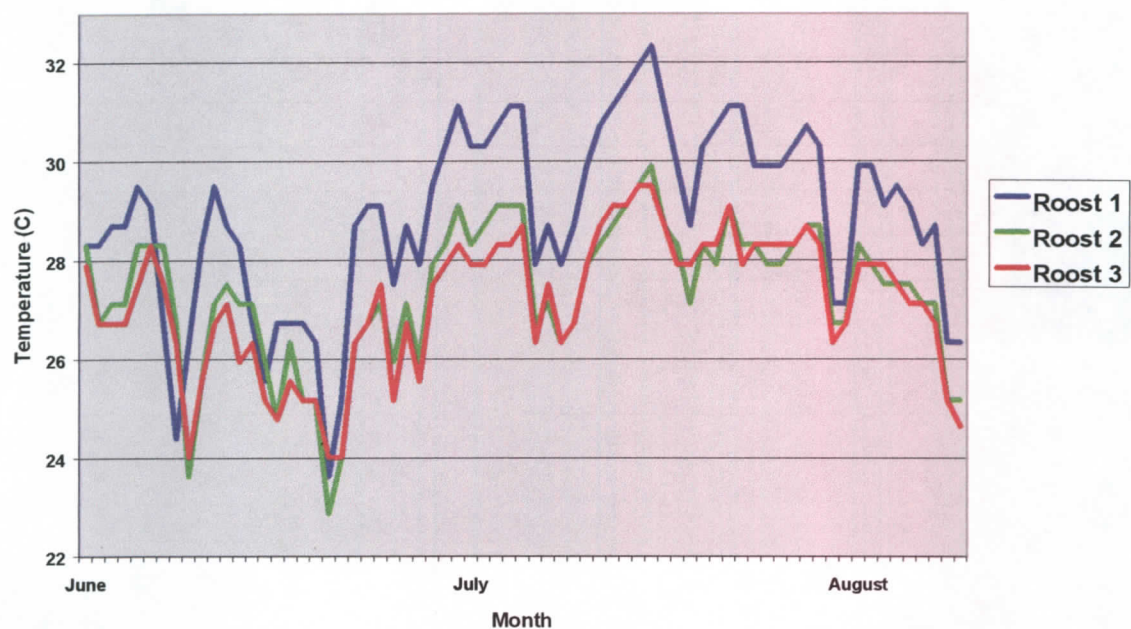


Figure 8: Maximum internal temperature for roosts 1-3 from June-August, 2002.

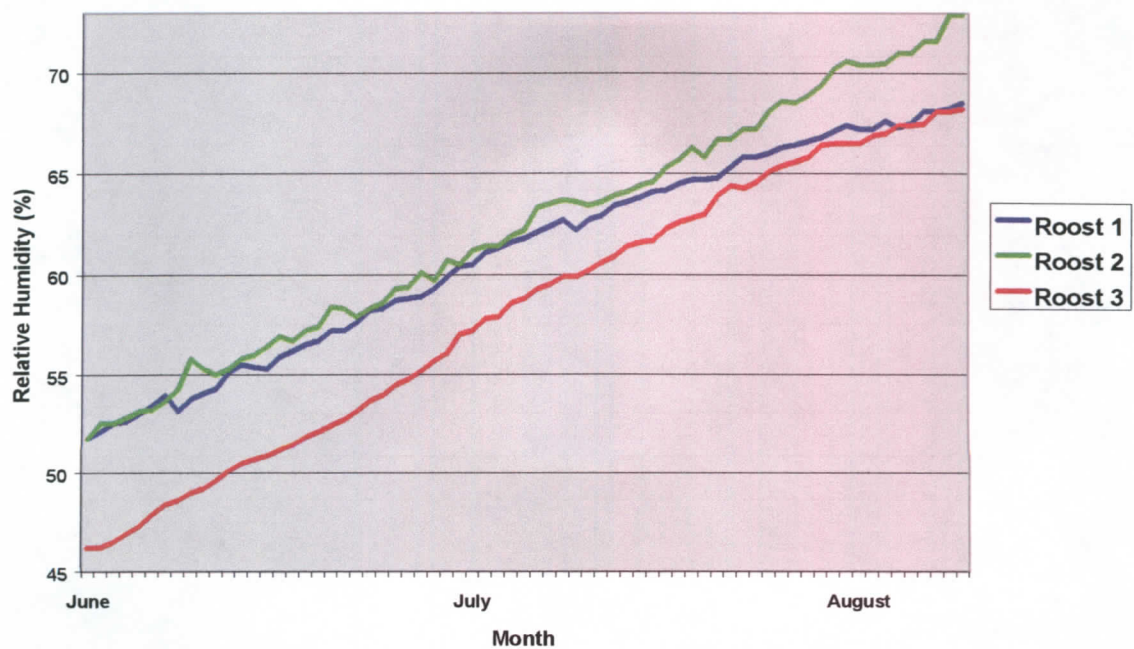


Figure 9: Minimum relative humidity for roosts 1-3 from June-August, 2002.

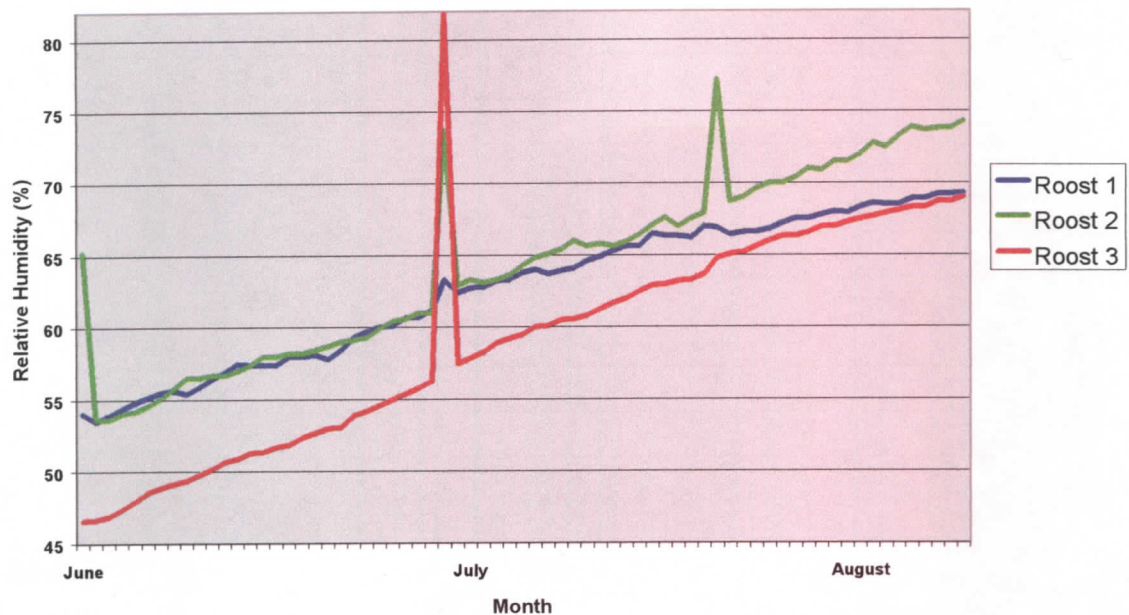


Figure 10: Maximum relative humidity for roosts 1-3 from June-August, 2002.

MINIMUM TEMPERATURE

House	ANOVA p-value	LSD p-value
All roosts	<0.0005	
Roost 1 vs 2		<0.0005
Roost 1 vs 3		<0.0005
Roost 2 vs 3		<0.0005

MINIMUM HUMIDITY

House	ANOVA p-value	LSD p-value
All roosts	<0.0005	
Roost 1 vs 2		<0.0005
Roost 1 vs 3		<0.0005
Roost 2 vs 3		<0.0005

MAXIMUM TEMPERATURE

House	ANOVA p-value	LSD p-value
All roosts	<0.0005	
Roost 1 vs 2		<0.0005
Roost 1 vs 3		<0.0005
Roost 2 vs 3		0.4261

MAXIMUM HUMIDITY

House	ANOVA p-value	LSD p-value
All roosts	<0.0005	
Roost 1 vs 2		<0.0005
Roost 1 vs 3		<0.0005
Roost 2 vs 3		<0.0005

Table 2: Statistical analysis for maximum and minimum temperature and humidity for roosts 1-3 from June-August, 2002. Differences were significant at $p < 0.05$ using ANOVA and Least Significant Tests.

Roost	Ratio	Sample Size
All Roosts	3:01	34
Roost 1	3:01	14
Roost 2	3:01	8
Roost 3	1:01	2
Roost 4	2:00	2

Table 3: Sex ratios (female : male) in roosts 1-4 from July-December, 2002.

Date	Male Weight (grams)	Female Weight (grams)
04/13/02		7
07/23/02		9.7
07/23/02		10
07/23/02		9
07/23/02		9.7
07/27/02		11.5
07/27/02		11
07/28/02		
07/28/02		9.2
08/16/02	9	
08/16/02		9
08/16/02		8.2
08/17/02	8.2	
08/17/02	7.5	
08/31/02		9
09/06/02		9.8
09/07/02		9
09/07/02		7.9
09/14/02		
09/15/02		9.3
09/15/02		8.6
09/15/02	9.3	
09/16/02		8.3
09/28/02		7.9
10/12/02		8.1
10/19/02		7.8
10/25/02		8
10/26/02		9
10/26/02	7.5	
12/13/02		8.9

Table 4: Weights of captured female and male *C. rafinesquii* from April-December, 2002.

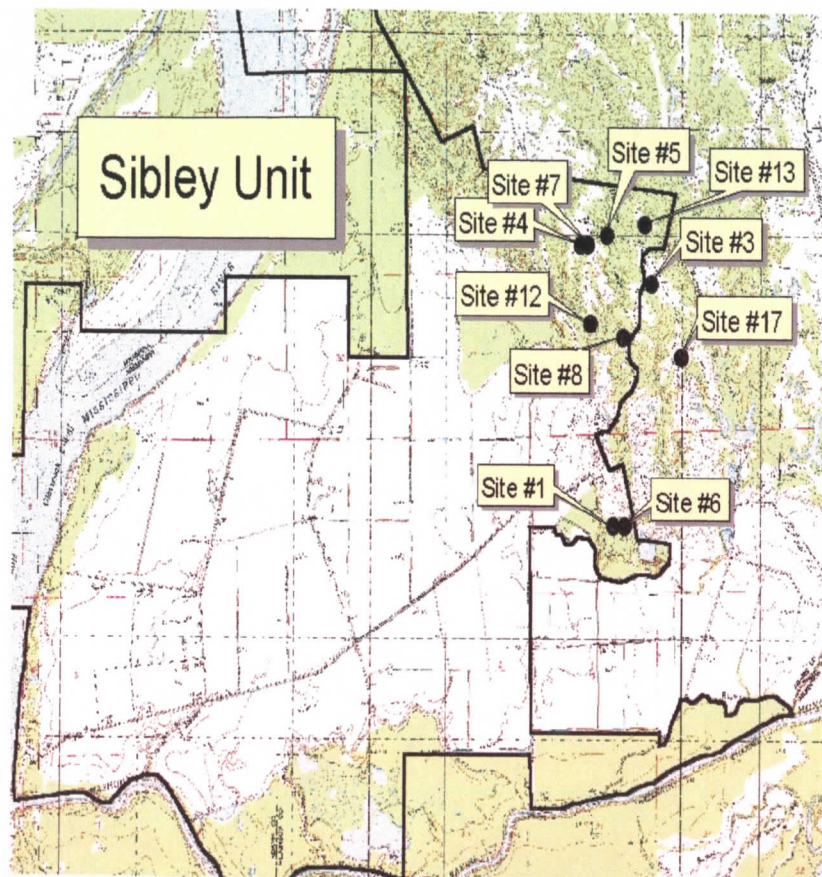


Figure 11: Mist Net Survey Sites on the Sibley Unit of St. Catherine Creek NWR, March-October 2002.

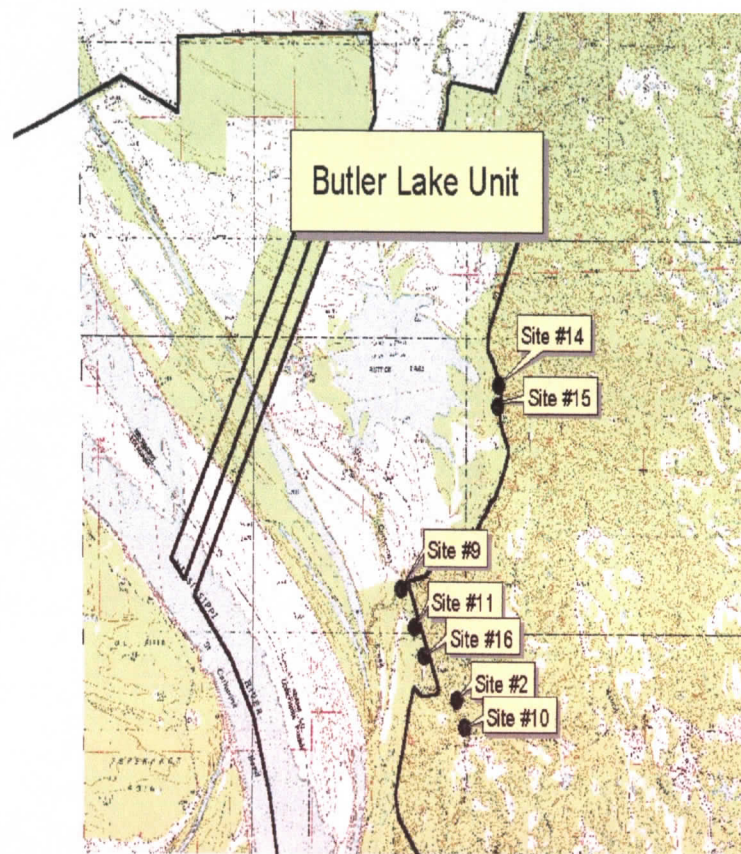


Figure 12: Mist Net Survey Sites on the Butler Lake Unit of St. Catherine Creek National Wildlife Refuge, March-October 2002.

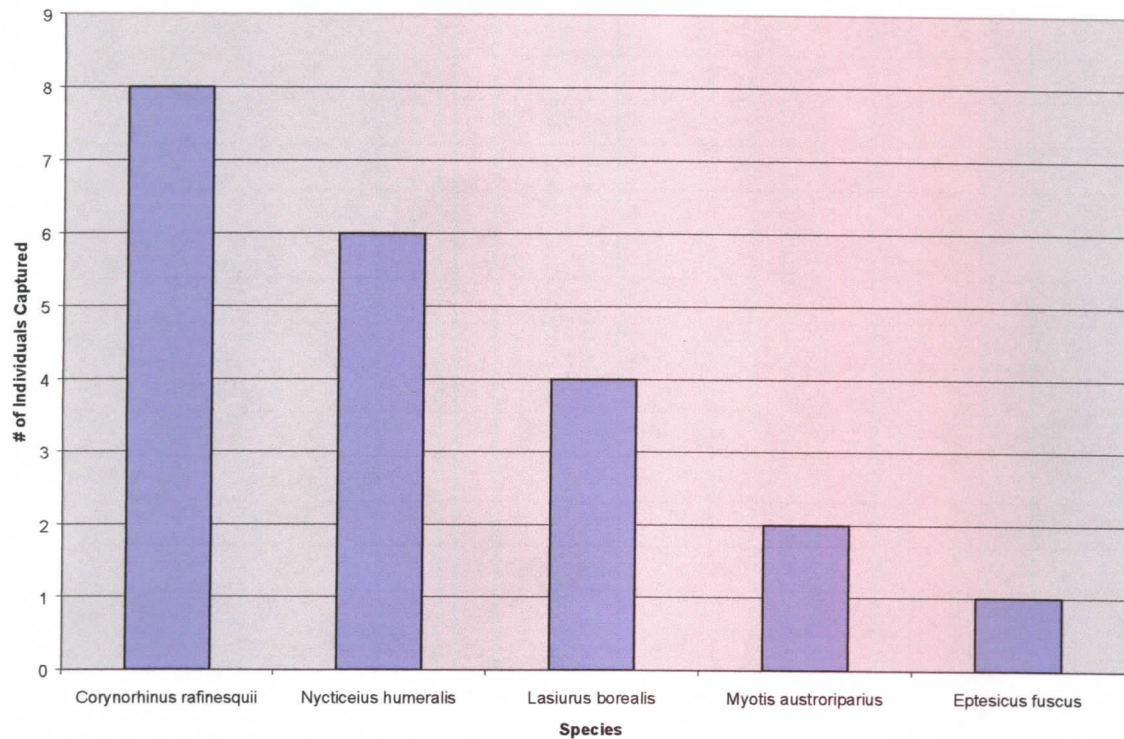


Figure 13: Number of individuals for each species captured while conducting mist-net surveys, March-October, 2002.

Site #	# of Surveys	Site Type	Habitat Type	Bats Captured	Number	Species
1	1	Dirt road	Mesic upland forest	Yes	1	RBEB
2	6	Pond	Upland mixed hardwoods	Yes	5,1,5,2	RBEB, SE, EB, I
3	2	Pond	Upland mixed hardwoods	Yes	1	RB
4	2	Pond	Upland mixed hardwoods	No		
5	2	Creek	Upland mixed hardwoods	No		
6	1	Pond	Open pasture	Yes	1	RB
7	2	Dirt road	Dry-mesic mixed oak-pine forest	No		
8	1	Open area	Open field	No		
9	1	Creek	Bald cypress swamp	No		
10	1	Pond	Upland mixed hardwoods	No		
11	1	Dirt road	Upland mixed hardwoods	No		
12	1	Creek	Bottomland hardwood forest	No		
13	3	Pond	Upland mixed hardwoods	Yes	1,1	SE, EB
14	1	Outside of roost 2	Mesic upland forest	Yes	2,1	RBEB, BB
15	1	Creek	Bald cypress swamp	No		
16	1	Pond	Upland mixed hardwoods	No		
17	1	Pond	Upland mixed hardwoods	No		

Table 5: Mist net sites, habitat description, and bats captured for mist net surveys, March-October, 2002.

RBEB = Rafinesque's big-eared bat

SE = Southeastern myotis

EB = Evening bat

RB = Red

bat

BB = Big brown bat